SEMINARIO

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Invariants of singularities in positive characteristic and the lack of upper-semicontinuity

Abstract: Resolution of singularities over fields of characteristic zero was proven in 1964 by H. Hironaka. The proof introduced by Hironaka lies deeply in the existence of hypersurfaces of maximal contact. These hypersurfaces contain the singular locus of the given variety in a very strong way. This fact allows him to reduce, after restriction to one of these hypersurfaces, to a smaller dimensional problem and to define an inductive function which will refine the complexity of the singularity.

In previous works, we have defined some new invariants that are intrinsic of the positive characteristic case, and have been used to prove some partial but relevant results (for example, resolution of singularities for 2-dimensional schemes).

These invariants define a function from the locus of highest multiplicity to the rational numbers. We will see that, in characteristic zero, this function specializes in the so-called Hironaka's order function, i.e., the one defined and used by Hironaka to prove resolution of singularities.

The drawback of these functions is that they do not define an upper semicontinuous function in the case of positive characteristic. In this work, we have investigated the points where there is a lack of upper semicontinuity and classify then. During the talk, we will see how to overcome this problem, and how to define a new invariant function such that:

(i) the function equals the previous one in the maximal spectrum;

(ii) the new function is upper semicontinuous.

This is a joint work with O. Villamayor.

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